PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-026186
(43)Date of publication of application : 27.01.1998

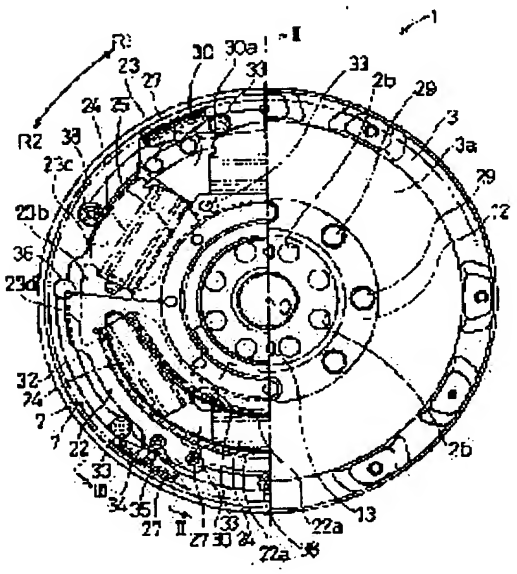
(51)Int.Cl. F16F 15/30
F16F 15/131

(21)Application number : 08-180942
(22)Date of filing : 10.07.1996

(71)Applicant : EXEDY CORP
(72)Inventor : KAJITANI KOJI
MIZUKAMI YUJI

(54) FLYWHEEL ASSEMBLY

(57)Abstract:
PROBLEM TO BE SOLVED: To interconnect a first flywheel and a second flywheel to be incapable of relative rotation in a low speed range by means of a highly reliable constitution.
SOLUTION: A flywheel assembly 1 comprises a first flywheel, a second flywheel 3, a damper mechanism 5, and a lever mechanism 7. The second flywheel 3 is disposed for free rotation relative to the first flywheel 2. The damper mechanism 5 interconnects the first flywheel 2 and the second flywheel 3 in the rotating direction. The lever mechanism 7 interconnect the first flywheel and the second flywheel 3 to be incapable of relative rotation when relative angle between both of the flywheels becomes equal to or greater than a specified value.



LEGAL STATUS

[Date of request for examination]	19.02.2001
[Date of sending the examiner's decision of rejection]	24.02.2004
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3839874

[Date of registration]	11.08.2006
[Number of appeal against examiner's decision of rejection]	2004-05982
[Date of requesting appeal against examiner's decision of rejection]	25.03.2004
[Date of extinction of right]	

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The flywheel assembly equipped with the lock device which will connect said both flywheels with relative rotation impossible if whenever [angular relation / of the elastic connection section which connects with a hand of cut the 1st flywheel, said 1st flywheel and the 2nd flywheel arranged free / relative rotation /, and said 1st flywheel and said 2nd flywheel, and said 1st flywheel and said 2nd flywheel] becomes more than a predetermined include angle.
[Claim 2] Said lock device is a flywheel assembly containing the friction clutch which connects said 1st flywheel and said 2nd flywheel according to claim 1.
[Claim 3] Said lock device is a flywheel assembly containing the operation system which will operate said lever device if it is prepared in a lever device and said lever device and whenever [torsion angular relation / of the clutch which can be connected with relative rotation impossible, and said 1st flywheel and said 2nd flywheel] becomes about said 1st flywheel and said 2nd flywheel more than a predetermined include angle according to claim 1.
[Claim 4] Said lock device is a flywheel assembly including the inertial-mass object which controls connection to said 1st flywheel and said 2nd flywheel according to a centrifugal force according to claim 1 to 3.
[Claim 5] Said clutch is a flywheel assembly according to claim 3 or 4 which is the friction clutch which connects said 1st flywheel and said 2nd flywheel.
[Claim 6] Said friction clutch is a flywheel assembly according to claim 2 to 5 which is prepared in said lever and counters said 2nd flywheel including the lever by which, as for said lever device, the supporting point was fixed to said 1st flywheel.
[Claim 7] Said 2nd flywheel is a flywheel assembly according to claim 6 which has the friction engagement section to which the projection aforementioned friction clutch counters said 1st flywheel side.
[Claim 8] It is the flywheel assembly according to claim 7 which said friction engagement section is the inner skin of the body prolonged in said 1st flywheel side from the periphery of said 2nd flywheel, and has the arc side where said friction clutch met said inner skin of said body.
[Claim 9] It is the flywheel assembly according to claim 6 to 8 with which the operated section to which said operation system can contact the end of said lever is prepared, and said inertial-mass object is prepared in the other end of said lever.
[Claim 10] Said operation system is a flywheel assembly according to claim 3 to 9 which has the inclination push raising side which can contact said operated section.
[Claim 11] Said lever device is a flywheel assembly according to claim 9 or 10 which contains further the body of revolution prepared in said operated section.
[Claim 12] Said operation system is a flywheel assembly according to claim 3 to 11 which is the flange material which has the hold section which is fixed to said 2nd flywheel and holds said elastic connection section.
[Claim 13] Said elastic connection section is a flywheel assembly according to claim 1 to 12 which has two or more elastic members arranged in the hand of cut at the serial.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a flywheel assembly and the flywheel assembly which established the damper device between each flywheel especially divided into two.
[0002]
[Description of the Prior Art] A flywheel is attached in the back end of an engine crankshaft, and prevents the rotation unevenness at the time of low r.p.m. operation by the moment of inertia. Moreover, the ring gear for starting, a clutch, etc. are attached in a flywheel. This flywheel is divided into the 1st flywheel and the 2nd flywheel, and the flywheel assembly which established the damper device between them is known. The damper device contains the elastic member arranged so that it may be compressed into a circumferencial direction, if both flywheels carry out relative rotation. Moreover, there is a thing equipped with the friction developmental mechanics which acts on an elastic member and juxtaposition in a damper device.
[0003] drive-system-for example, ******** at the time of transit as a **** problem produced from the drive transfer system of a vehicle -- and it is filled and there is a sound. In order to reduce these ****, it is necessary to set up drive-system torsion resonance frequency lower than an engine practical use rotation region by lowering the torsal rigidity of an acceleration-and-deceleration torque region as much as possible. In order to lower torsal rigidity in a damper device, the torsion include angle of an elastic member can be made large, or it is possible to arrange two or more elastic members so that it may act on a serial.
[0004]
[Problem(s) to be Solved by the Invention] On the other hand, in 2 division flywheel assembly, when engine starting and an engine are cut, the resonance point in a low rotation region (for example, 500 or less rpm) is passed. At this time, excessive torque fluctuation arises, a damper device may be damaged or a sound/vibration may become intense. When the 1st flywheel and the 2nd flywheel are locked in a low-speed rotation region and it becomes a high-speed rotation region as shown in JP,5-18440,A in order to solve such a problem for example, there is a lock device which makes a damper device ready condition by canceling both lock. The lock device shown in JP,5-18440,A has the lock member which locks both flywheels, and the elastic member which energizes a lock member in a lock location. In a low-speed rotation region, if a lock member is energized by the spring, and is arranged in a lock location and it becomes a high-speed rotation region, a lock member will move to the method of the outside of radial according to a centrifugal force, and will move to a lock discharge location by overcoming the energization force from an elastic member. In this flywheel assembly, the fitting section for a lock member to fit in is formed in both flywheels. Structure is complicated in order to form these fitting sections. Moreover, as for a lock member, a life lacks in dependability short by the torque which acts. Furthermore, since a lock member is pinched by both flywheels in a lock location, becoming migration impossible is also considered by the lock discharge location.
[0005] The purpose of this invention is to connect the 1st flywheel and the 2nd flywheel with relative rotation impossible in a low-speed rotation region with easy structure. Other purposes of this invention are to connect the 1st flywheel and the 2nd flywheel with relative rotation impossible in a

low-speed area with reliable structure.
[0006]
[Means for Solving the Problem] The flywheel assembly according to claim 1 is equipped with the 1st flywheel, the 2nd flywheel, the elastic connection section, and a lock device. The 2nd flywheel is arranged free [the 1st flywheel and relative rotation]. The elastic connection section connects the 1st flywheel and the 2nd flywheel with a hand of cut. A lock device will connect both flywheels with relative rotation impossible, if whenever [angular relation / of the 1st flywheel and said 2nd flywheel] becomes more than a predetermined include angle.
[0007] Rotation of the 1st flywheel transmits torque to the 2nd flywheel through the elastic connection section. If the resonance point is passed in a low rotational frequency region, the torsion include angle of the 1st flywheel and the 2nd flywheel will become large by excessive torque fluctuation, and a lock device will connect both flywheels with relative rotation impossible. For this reason, the torsion vibration between both flywheels is prevented and it is hard coming to generate breakage of the elastic connection section etc., and the sound/vibration at the time of resonance.
[0008] In the flywheel assembly according to claim 2, the lock device contains the friction clutch which connects the 1st flywheel and the 2nd flywheel. A friction clutch is easy structure and it is not necessary to process it to the 1st flywheel and the 2nd flywheel specially. Moreover, the dependability of a friction clutch in a life and actuation nature is high.
[0009] In a flywheel assembly according to claim 3, a lock device contains the operation system which operates a lever device, when it is prepared in a lever device and a lever device and whenever [torsion angular relation / of the clutch which can be connected with relative rotation impossible, and the 1st flywheel and the 2nd flywheel] becomes about said 1st flywheel and said 2nd flywheel more than a predetermined include angle.
[0010] The big energization force is acquired by the lever ratio and connection to the 1st flywheel and the 2nd flywheel is certain. In the flywheel assembly according to claim 4, the lock device includes the inertial-mass object which controls connection to the 1st flywheel and the 2nd flywheel according to a centrifugal force.
[0011] In a flywheel assembly according to claim 5, a clutch is a friction clutch which connects the 1st flywheel and the 2nd flywheel. In the flywheel assembly according to claim 6, the lever device contains the lever by which the supporting point was fixed to the 1st flywheel. A friction clutch is prepared in a lever and counters the 2nd flywheel.
[0012] In the flywheel assembly according to claim 7, the 2nd flywheel has the friction engagement section to which a projection friction clutch counters the 1st flywheel side. In a flywheel assembly according to claim 8, the friction engagement section is the inner skin of the body prolonged in the 1st flywheel side from the periphery of the 2nd flywheel. The friction clutch has the arc side which met the inner skin of a body.
[0013] In the flywheel assembly according to claim 9, the operated section which an operation system can contact is prepared in the end of a lever. The inertial-mass object is prepared in the other end of a lever. In the flywheel assembly according to claim 10, the operation system has the inclination push raising side which can contact the operated section.
[0014] In the flywheel assembly according to claim 11, the lever device contains further the body of revolution prepared in the operated section. For this reason, actuation in case an operation system operates the operated section becomes smooth. In a flywheel assembly according to claim 12, an operation system is flange material which has the hold section which is fixed to the 2nd flywheel and holds the elastic connection section.
[0015] In the flywheel assembly according to claim 13, the elastic connection section has two or more elastic members arranged in the hand of cut at the serial. Therefore, the torsion property of low rigidity and an extensive torsion include angle is acquired, and it is [at the time of low-speed transit] filled, and hard coming to generate a sound.
[0016]
[Embodiment of the Invention] The flywheel assembly 1 as 1 operation gestalt of this invention is shown in drawing 1 and drawing 2 . This flywheel assembly 1 is equipment which is attached in the

back end of an engine crankshaft (not shown), and transmits torque to a transmission side through the clutch equipment which is not illustrated.

[0017] This flywheel assembly 1 mainly consists of the 1st flywheel 2, the 2nd flywheel 3, an absorber device 5, and a lever device 7. The 1st flywheel 2 is a disc-like member, and tubed central boss 2a prolonged in a transmission side (drawing 2 right-hand side) is formed in the core. the hole with which a crank bolt 11 is inserted in this central boss 2a -- 2b is formed. Moreover, bearing 15 is being fixed to the inner circumference side of central boss 2a. This bearing 15 is supported for the tip of the Maine drive shaft which is prolonged from a transmission side and which is not illustrated, enabling free relative rotation. Bearing 4 is formed in the periphery of central boss 2a. Since this bearing 4 is fixed, the disc-like fixed plate 12 is being fixed at the tip of central boss 2a with the bolt 13. The ring gear 14 is being fixed to the periphery of the 1st flywheel 2.

[0018] The 2nd flywheel 3 is the member of the shape of a disk type with a larger bore than the 1st flywheel 2. The inner circumference section of the 2nd flywheel 3 is supported by central boss 2a of the 1st flywheel 2 free [relative rotation] through bearing 4. Flat friction surface 3a is formed in the transmission side of the 2nd flywheel 3. Furthermore, two or more vent 3b prolonged in a circumferencial direction is formed in the inner circumference side from friction surface 3a. Vent 3b has penetrated the 2nd flywheel 3 to shaft orientations. Cylinder lobe 3c which projects in an engine 2, i.e., 1st flywheel, side (left-hand side of drawing 2) is formed in the periphery section of the 2nd flywheel 3. The inner skin of cylinder lobe 3c is 3d of friction surfaces.

[0019] The damper device 5 is arranged in the space between the 1st flywheel 2 and the 2nd flywheel 3. this damper device 5 -- the 1st flywheel 2 and the 2nd flywheel 3 -- predetermined include-angle within the limits -- relativity -- it has connected pivotable. The absorber device 5 mainly consists of the 1st drive plate 21, the 2nd drive plate 22, a driven plate 23, two or more coil springs 24, and a float object device 25. The 1st drive plate 21 and the 2nd drive plate 22 are the disk type-like members made from a sheet metal, respectively, and only predetermined distance leaves them and they are arranged at shaft orientations. The 1st drive plate 21 and the 2nd drive plate 22 are being fixed to the 1st flywheel 2 with the rivet 27 of plurality [section / periphery]. With this rivet 27, the distance of the shaft orientations of the 1st drive plate 21 and the 2nd drive plate 22 is maintained. The window holes 21a and 22a which extend in a circumferencial direction are formed in the direction pars intermedia of a path of the 1st drive plate 21 and the 2nd drive plate 22. It cuts on radial both sides of three window holes 21a and 22a, and the lifting sections 21b and 22b are formed.

[0020] The driven plate 23 is the member of the shape of a disk type arranged between the 1st drive plate 21 and the 2nd drive plate 22. Boss 23a by which the projection bolthole was slightly formed in the transmission side is formed in the inner circumference section of the driven plate 23. The bolt 29 is screwing in the bolthole of boss 23a through the hole formed in the inner circumference section of the 2nd flywheel 3 from the transmission side. That is, the driven plate 23 is being fixed to the 2nd flywheel 3 with the bolt 29. The inner skin of the driven plate 23 is being fixed to the outer race of bearing 4. The window hole corresponding to the window holes 21a and 22a of the 1st and 2nd drive plates 21 and 22 is formed in the driven plate 23. This window hole does not have a periphery edge and is opened on the radial outside. The configuration of this window hole can also be expected to form three supporter 23b prolonged on the driven plate 23 on the radial outside. Between three circumferencial directions of supporter 23a serves as the above-mentioned window hole. Supporter 23b has a sector which spreads in a circumferencial direction at both sides as it goes to the method of the outside of radial. Moreover, elutriation limit section 23c further prolonged on circumferencial direction both sides is formed in the radial outside of supporter 23b. Gradually, it becomes high, and pushes up to the method of the outside of radial, and 23d of fields is formed in the method opposite side of R2 rotation of the periphery edge of supporter 23b as it goes to R2 side.

[0021] In the window holes 21a and 22a of the 1st and 2nd drive plates 21 and 22, and each window hole of the driven plate 23, one pair of coil springs 24 are arranged, respectively. One pair of coil springs 24 are prolonged in the shape of a straight line in the tangential direction of a damper device periphery. The coil spring of two size is arranged at this alignment, and each coil spring 24 is

constituted.

[0022] The float object device 25 is a middle linkage for being arranged among one pair of coil springs 24 arranged in each window hole, and performing torque transmission between both the coil springs 24. The float object device 25 consists of three float objects 30 and one pair of ring-like plates 41 and 42. Each float object 30 is arranged between two coil springs 24 in each window hole. The float object 30 has a sector to which circumferencial direction width of face becomes large as it goes to a radial outside. Furthermore, elutriation limit section 30a which is prolonged on circumferencial direction both sides and restricts the elutriation to the radial outside of both the coil springs 24 is formed in the radial outside of the float object 30. As shown in drawing 2 , the float object 30 has the lobe prolonged on shaft-orientations both sides, in order to contact the end face of a coil spring 24 certainly. Two ring-like plates 41 and 42 are arranged between the inner circumference section shaft orientations of the 1st and 2nd drive plates 21 and 22. The radial inside edge of the float object 30 is being fixed to these ring-like plates 41 and 42 free [rocking] with the rivet 43.

[0023] The inner circumference edge of the ring-like plate 42 and the 2nd drive plate 22 is in contact with the boss 23a peripheral face of the driven plate 23. The lever device 7 is a device for connecting both (the relative rotation between both members being lost), when the torsion include angle of the 1st flywheel and the 2nd flywheel becomes large by excessive torque fluctuation in a low-speed rotation field. The lever device 7 is arranged [in the circumferencial direction] at equal intervals between the shaft orientations of the 1st flywheel 2 and the 2nd flywheel 3 at three places. Henceforth, only one lever device 7 is explained.

[0024] The lever device 7 consists of rollers 38 formed in the other end of the friction clutch 34 fixed to the lever 32 prolonged in the shape of radii, and the lever 32, the inertial-mass object 36 prepared in the end of a lever 32, and a lever 32. The circumferencial direction pars intermedia of a lever 32 serves as the supporting point fixed to the 1st flywheel 2 with the supporting-point bolt 33. Centering on this supporting-point bolt 33, a lever 32 is rockable. The friction clutch 34 is arranged from the supporting-point bolt 33 of a lever 32 in the method opposite side of R2 rotation, and has countered 3d of friction surfaces formed in the cylinder lobe 3c inner skin of the 2nd flywheel 3. Furthermore, the friction material 35 is being fixed to the field of the side which counters 3d of friction surfaces of a friction clutch 34. A friction clutch 34 and the friction material 35 have the radii shaped surface which meets the inner skin of cylinder lobe 3c. The inertial-mass object 36 is formed in R1 hand-of-cut edge of a lever 32. Moreover, the roller 38 is formed in R2 hand-of-cut edge of a lever 32.

[0025] Next, actuation of the flywheel assembly 1 is explained. Starting of the engine which is not illustrated transmits torque to the 1st flywheel 2 from a crankshaft. Torque is transmitted to the 2nd flywheel 3 through the damper device 5 from the 1st flywheel 2. If excessive torque fluctuation arises with the flywheel assembly 1 at the time of resonance point passage in a low rotational frequency field (for example, a rotational frequency 0 - 500rpm), the torsion include angle of the 1st flywheel 2 and the 2nd flywheel 3 will become large. At this time, in the absorber device 5, a coil spring 24 is compressed and the torsion include angle of drive plates 21 and 22 and the driven plate 23 becomes large. Then, 23d of supporters or the lever device 7 of the driven plate 23 is operated, and the 1st flywheel 2 and the 2nd flywheel 3 are connected with relative rotation impossible. Consequently, it is hard to produce breakage of damper device 5 grade, and a sound/vibration.

[0026] The connection condition of the lever device 7 is explained to a detail. In the condition which shows in drawing 4 , even if there is torque fluctuation, it is small, and it is suppressed that a friction clutch 34 moves to 3d side of friction surfaces of cylinder lobe 3c because the inertial-mass object 36 (drawing 1) moves to the method of the outside of radial according to a centrifugal force. If the torsion include angle of drive plates 21 and 22 and the driven plate 23 becomes large, as shown, for example in drawing 5 , supporter 23b of the driven plate 23 moves to R1 hand of cut to the lever device 7, supporter 23b will push up and 23d of fields will move a roller 38 to the method of the outside of radial. The lever device 7 operates smoothly because a roller 38 rotates. Consequently, the friction member 35 of a friction clutch 34 is forced on 3d of friction surfaces of cylinder lobe 3c through a lever 32. At this time, the force in which a friction clutch 34 is energized by cylinder lobe

3c acts as lever ratio Bai of the force in which supporter 23b energizes a roller 38. Thus, the big energization force is acquired according to the lever device 7, and connection to the 1st flywheel 2 and the 2nd flywheel 3 is ensured.

[0027] If an engine rotational frequency becomes high (for example, 500 or more rpm), the torque of the 1st flywheel 2 will be transmitted to the 2nd flywheel 3 through the damper device 5. Since one pair of serial coil springs [3 sets of] 24 are formed in the damper device 5, it twists, while torsal rigidity becomes low, and the include angle is large. Therefore, it is not necessary to establish frictional resistance developmental mechanics, and torsional oscillation can be decreased by few sliding frictions produced between each part material. drive-system-above result ******** at the time of transit -- and it is filled and the sound is reduced.

[0028]

[Effect of the Invention] If the resonance point is passed in a low rotational frequency region, in order that the torsion include angle of the 1st flywheel and the 2nd flywheel may become large by excessive torque fluctuation and a lock device may connect both flywheels with relative rotation impossible, the torsion vibration between both flywheels is prevented and it is hard coming to generate breakage of the elastic connection section etc., and the sound/vibration at the time of resonance in the flywheel assembly concerning this invention.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The top view of the flywheel assembly as 1 operation gestalt of this invention.
[Drawing 2] The II-II sectional view of drawing 1 .
[Drawing 3] III-III of drawing 1 Sectional view.
[Drawing 4] the part which shows the deconcatenation condition in a lever device -- a cross-section top view.
[Drawing 5] the part which shows the connection condition in a lever device -- a cross section.
[Description of Notations]
1 Flywheel Assembly
2 1st Flywheel
3 2nd Flywheel
5 Damper Device
7 Lever Device
32 Lever
33 Supporting-Point Bolt
34 Friction Clutch
35 Friction Material
36 Inertial-Mass Object
38 Roller

[Translation done.]